

CLAIMS

5 1 - Humanized biomaterial comprising a porous biocompatible composite material customized and implanted with monocyte derived cells and preferably with macrophages.

10 2 - Humanized biomaterial according to claim 1, wherein the biocompatible composite material is chosen among the following materials : microfibers, ceramic materials, metal oxides such as aluminum oxide, calcium phosphate ceramic, glass or carbon fibers, hydroxylapatite, silicon carbide or nitride, collagen polymers or a mixture of these different materials.

15 3 - Humanized biomaterial according to claims 1 or 2, wherein the human macrophages are liable to be obtained by *ex vivo* differentiation from blood monocytes leading to living macrophages, and are cultured under conditions enabling their penetration and adherence into the biomaterial, for instance for several hours at 37°C, with the porous biomaterial, allowing infiltration of the biomaterial and substantially
20 irreversible binding of the living macrophages to the biomaterial, being humanized with patient's macrophages and ready for implantation.

25 4 - Living body-supporting implant, characterized by the fact that it comprises or consists of the humanized biomaterial according to any one of claims 1 to 3, and is preferably structured under the form of scaffold, tissue-supporting sponges, bone or cartilage.

30 5 - Use of a humanized biomaterial according to any one claims 1 to 3 or of a living body-supporting implant according to claim 4, for the preparation of a tissue implant destined to replace or repair defective tissue, such as defective bone, cartilage, dental tissue, fibrous tissue, fibrocartilaginous supporting tissue.

35 6 - Use of a humanized biomaterial according to any one of claims 1 to 3 or of a living body-supporting implant according to claim 4, wherein the monocyte derived cells or macrophages are autologous with respect to the tissue to be replaced or repaired, enabling the biomaterial or the living body-supporting implant to be recognized as self.

7 - Process for the preparation of a humanized biomaterial according to any one claims 1 to 3, comprising the following steps :

- 5 - preparation of the porous biomaterial structured in form of bones; cartilage,
- preparation of macrophages from blood monocytes,
- immersion of the biomaterial in a physiologic solution appropriate for the culture of macrophages which are added afterwards (ex. : phosphate buffered saline, medium such as RPMI, IMDM, AIMV),
- 10 - addition of the macrophages to the solution under conditions enabling binding to biomaterial and particularly for 1 to 20 h. at 37°C,
- 5 % CO₂ and 5 % air,
- washing of the biomaterial and conservation until use in physiologic medium.
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8 - Process for the preparation of a living body-supporting implant according to claim 4, comprising the following steps :

- 20 - preparation of a customized porous implant or scaffold composed of bio-compatible material, according to any one of claims 1 to 3,
- preparation of macrophages from blood monocytes of the patient needing the customized implant of biomaterial,
- co-culture of macrophages and the implant in adequate medium
- 25 under conditions enabling penetration and adherence to the biomaterial in particular at 37°C, 5% CO₂ in hydrophobic bags or containers until grafting the implant.

9 - Use of the humanized biomaterial according to any one of claims 1 to 3 or of a living body-supporting implant according to claim 4, which can be implanted in a tissue, for the *in vitro* or *in vivo* or *ex vivo* delivery of factors chosen in the group of chemokines and/or monokines, and/or cytokines and/or growth factors, the factors released being useful for the local attraction of cells required for tissue growth (such as osteoblasts, chondrocytes, fibroblasts, epithelial cells.....) and/or for the neovascularization around the implanted biomaterial, and/or for the release of growth factors sustaining proliferation of cells and/or the growth of new tissues.

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10 - Use of the humanized biomaterial according to any one of claims 1 to 3 or of a living body-supporting implant according to claim 4, as a graft for the replacement of supporting tissues such as bones, cartilages, dental tissues, epithelial sheet and subcutaneous tissue matrix.